Stone Channeling Machines :: :: The Ingersoll-Sergeant Drill Company

Catalog No. 60 September, 1905

The Ingersoll-Sergeant Drill Company

Officers

W. L. Saunders, *President*
John A. McCall, J. P. Grace, Geo. R. Elder, *Vice-Presidents*
Geo. Doubleday, *Treasurer*
W. R. Grace, *Secretary*

Main Office

11 Broadway, New York

Sales Offices

Chicago, Illinois	Old Colony Building
Cleveland, Ohio	Williamson Building
Philadelphia, Pennsylvania	Arcade Building
Pittsburg, Pennsylvania	Farmers National Bank Building
Boston, Massachusetts	77 Oliver Street
St. Louis, Missouri	Fullerton Building
El Paso, Texas	121 San Francisco Street
Lake Superior Branch	Houghton, Mich.
Denver, Colorado	1718 California Street
San Francisco, California	21 Fremont Street
Birmingham, Alabama	1918 Morris Avenue
Salt Lake City, Utah	224-232 Southwest Temple Street
Butte, Montana	300 Main Street
St. Paul, Minnesota	Fourth and Wacouta Streets
Seattle, Washington	115 Jackson Street
Tacoma, Washington	1746 1748 Pacific Avenue
Montreal, Canada	Sovereign Bank Building
Mexico City	2a De Dolores No. 20, Mexico, D. F.
London, England	114 Queen Victoria Street
Sydney, New South Wales	60 Clarence Street
Kalgoorlie, West Australia,	Palace Building
Johannesburg, South Africa	National Bank Building
Valparaiso, Chili	W. R. Grace & Co.
Lima, Peru	W. R. Grace & Co.
Paris, France	51 Rue de la Chaussee D'Antin
Berlin, Germany	Kaiser Wilhelm Strasse 49
St. Petersburg, Russia	Galernaya 5

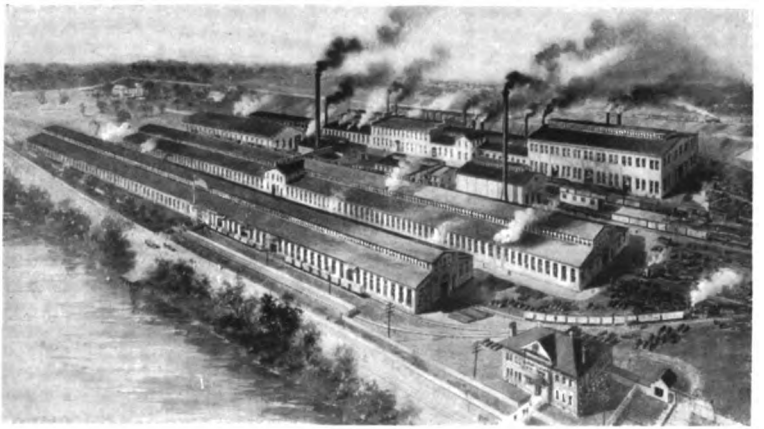
Cable Address

"Ironchain New York" "Ingersoll London"
"Airmachine Berlin" "Parex Paris"
"Outsider Johannesburg" "Ingersoll Kalgoorlie"

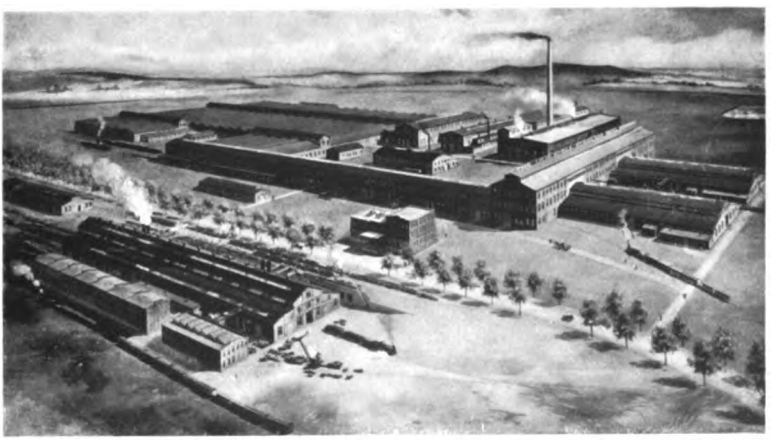
Ingersoll-Sergeant, Leiber's, Fraser and Chalmers, A1, Broomhall's and A B C Codes used

When referring to this catalog use the telegraph name *Syxtie*.

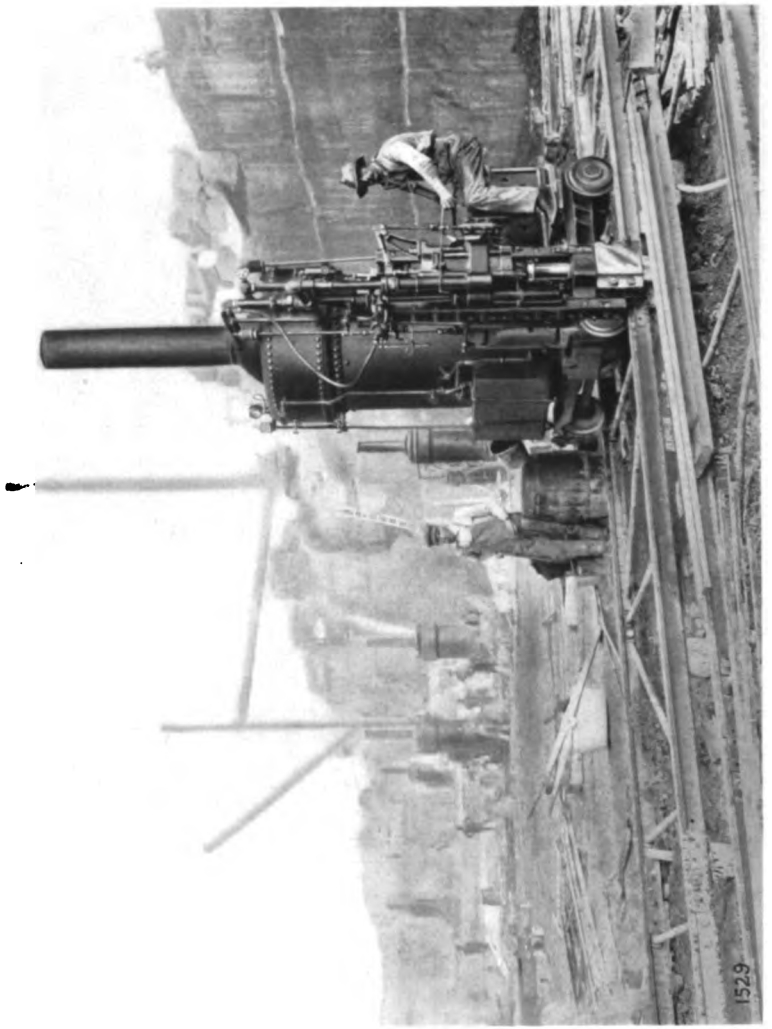
Shops where the Ingersoll-Sergeant Stone Channelers are Made



Manufacturing Plant of the Ingersoll-Sergeant Drill Co. at Easton, Pa.



Manufacturing Plant of the Ingersoll-Sergeant Drill Co. at Phillipsburg, N. J.



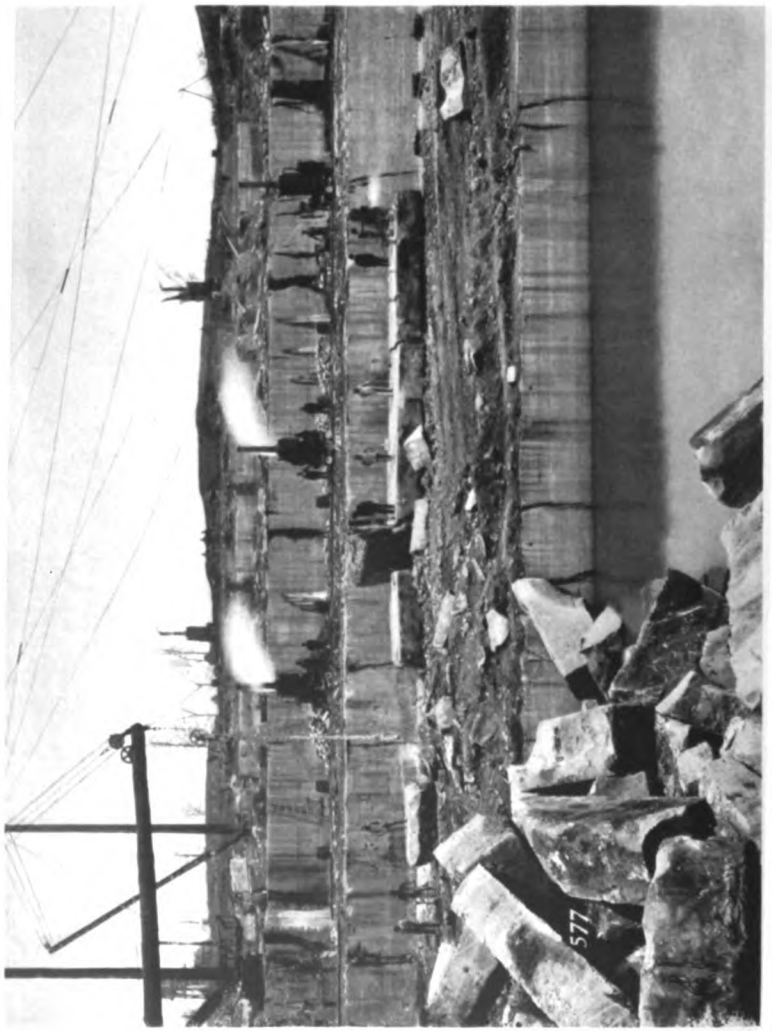
Ingersoll-Sergeant "H 8" Track Channelers in operation in the Quarries at Bedford, Indiana.

Ingersoll-Sergeant Stone Channeling Machines

TWENTY years ago the Ingersoll-Sergeant Drill Company patented and placed on the market the first direct-acting stone channeling machine. It was an outgrowth of an extended experience in the building and operation of rock drills in all conditions of service. Its design was based upon the conviction that the same principles which had made the Ingersoll-Sergeant drill the best, would, properly applied, give the best results in cutting a channel. It was believed that the direct-acting machine possessed points of decided advantage over the slow, cumbersome diamond and lever types of rock-cutting machinery of that day.

The new channeler embodied these ideas of its designers, and though it was inevitable that certain shortcomings would appear in the first models, still it is an interesting fact that some of these first machines are in service to-day after more than fifteen years of continuous use and are still doing good work. The success of these pioneer types demonstrated beyond question the merit of the direct-acting principle now everywhere conceded as the correct one and it remained only to develop to the utmost the details of mechanical construction. With this idea in view, the performance of the machine was closely studied and the opinions of practical quarrymen combined with the judgment of the designers. As a result of this painstaking care the channeler has developed through the evolution of successive models, each better than the last; improvements have kept pace with the passing of years and the growth of experience; and the new Ingersoll track channeler as it stands to-day is practically a new machine from the rails up. In performance it has far outdone its forerunner; where the old machine cut 125 feet, the new channeler cuts 250 feet in the same time; in harder rock, where 90 feet was considered good for the old machine, 150 feet of channel is an average performance for the new model.

Not only have high power and cutting speed been secured, but endurance and reliability also have been given most careful



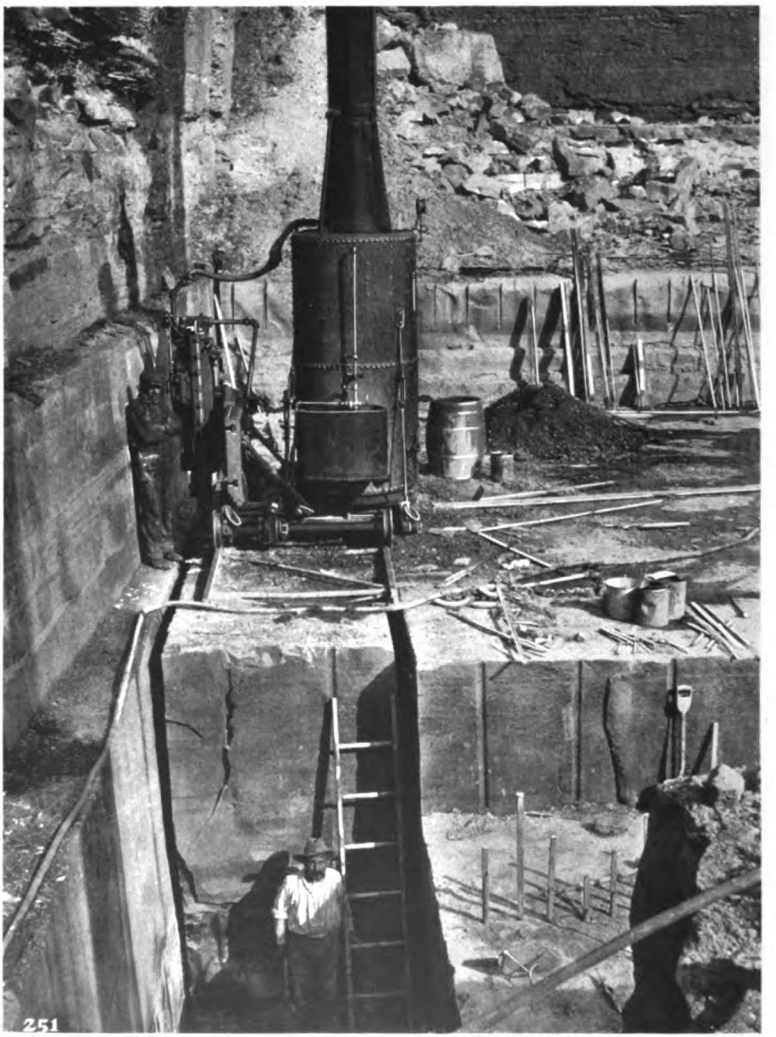
Quarrying with Ingersoll-Sergeant Track Channelers
in the Indiana Oolitic District.

thought. The number of working parts has been reduced and the individual parts strengthened. Development in modern metals, toughened, hardened and made durable to the highest degree, has been an important feature in this advance. The questions of economy of fuel have been carefully studied and the inherent losses have been reduced to the limit. The result of all this care has been that the Ingersoll-Sergeant Track Channeler of to-day embodies in highest degree three qualities which have been found essential to success in continuous hard service:

Economy, Simplicity and Reliability.

To these inherent excellencies is added a great cutting speed, a tremendous capacity for hard work, which has made the performance of these channelers the standard of progress.

Opening up a Quarry in the Indiana Oölitic District
with Ingersoll-Sergeant Track Channelers



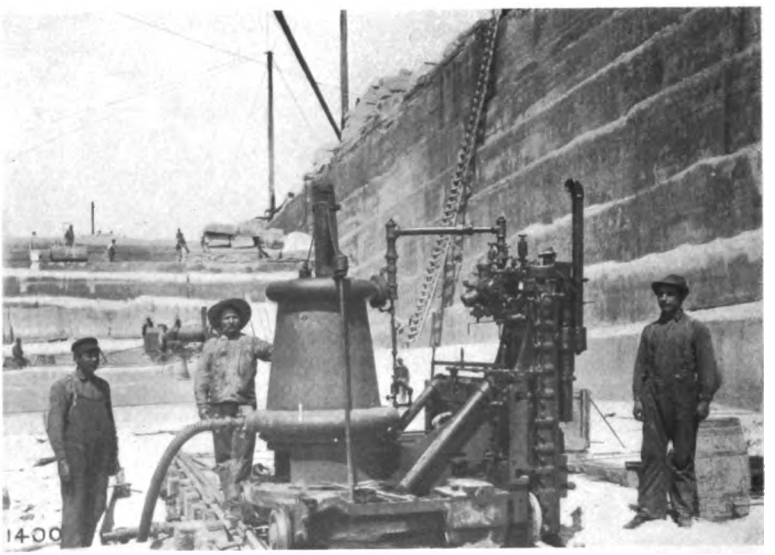
Channeling a 9-foot Key Block. This Ingersoll-Sergeant Track Channeler has been in constant use for over seventeen years.

The Field and Performance of the Ingersoll-Sergeant Fixed Back Channeling Machines

THE Ingersoll-Sergeant Fixed Back Track Channeler was designed primarily for the heaviest work and the deepest cuts, in open quarries of limestone, sandstone, slate and other materials, where the output is in dimension stone. In this service it has found its greatest field in making the long, deep, longitudinal cuts which are preliminary to further breaking by the plug and feather method.

This channeler has found another valuable field of application in certain classes of heavy contracting work, such as canals and reservoirs. The advantage of the track channeling machine in this work is threefold; first, the limits of excavation can be distinctly marked by channeling along the limiting line and shooting out within this mark; second, the quantity of rock to be broken and removed is confined strictly to the limits of cut—an item often of great consequence when competition is keen and prices low; third, the walls of the excavation are left smooth and solid, requiring the minimum of attention and maintenance. A notable instance of this canal work was seen in the Chicago Drainage Canal, where more than thirty Ingersoll-Sergeant track channelers of an earlier type were employed. The machines were also used in certain work in the enlargement of the Erie Canal and their performance was eminently satisfactory. At present a number of Ingersoll-Sergeant track channelers are employed on the new "Soo" Canal, in Michigan, while at the new dam of the Columbus (Ohio) Water Works, a track channeler of heavy type is being used to facilitate the removal of rock. These are instances showing the growing application of the track channeler as a part of the contractor's equipment. A peculiarity of this class of open-cut work with the channeling machine is that the firing of the blast at any level frequently shatters the material below that level. This remains to be cut on the next level and forces a very severe service upon the channeler—a service demanding a machine of great strength, high power and ready control. These conditions the "H8" and "H9" Track Channelers meet with greatest success.

The average cut with these heavy channeling machines is from eight to sixteen feet in depth, depending upon the nature of the stone. The gauge or width of the cut will depend upon the final depth sought. It may be from one and one-half to four inches at the start, reducing to a width of one and one-eighth inches with the last steels. The length of the channel is limited only by the length of track which can be used. Cutting speeds vary with the quality of rock and the handling of the machine. There are cases on record where the machine channeled 700 square feet in ten hours in oölitic limestone, during part of which time over 100 square feet per hour was cut. In Ohio sandstone of medium hardness, 260, 280 and 300 square feet per day of ten hours have been credited to the "H" channeler and these rates are being maintained as an average by the month. The average cost in this case runs from two and one-half cents to three and one-half cents per square foot cut. In other instances, runs under average conditions have repeatedly shown cuts of from 250 to 450 square feet of channel per shift of ten hours; the cost per square foot cut being in these cases from two to ten cents. On the Chicago Canal the cost was fifteen cents per square foot.

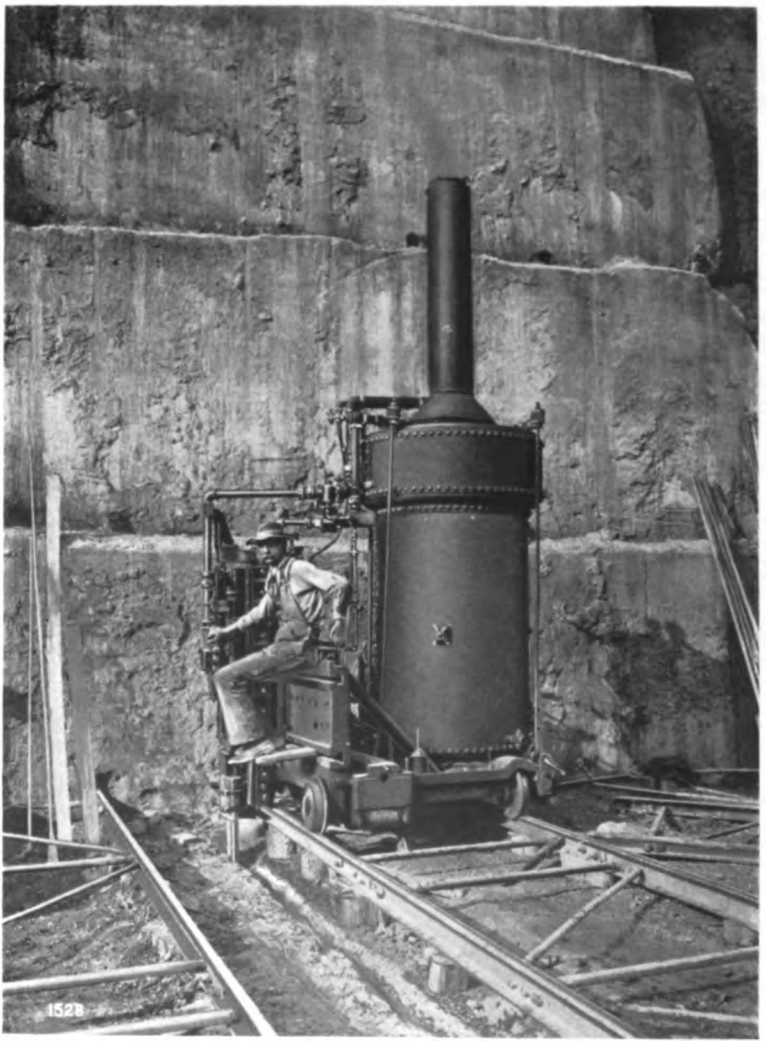


Ingersoll-Sergeant Track Channeler equipped with a Sergeant Reheater in the Grey Canon Quarry of the Cleveland Stone Company, North Amherst, Ohio.

The saving by the use of the machine channeler becomes apparent when the figures just stated are compared with the cost of hand methods applied to the same work, ranging from thirty to seventy-five cents per square foot. If to this saving in operating cost be added the further gain secured by the reduction of cutting waste, a still higher economy must be credited to the power channeler. Ordinary conditions of operation will require only two men on each channeler; and even in most arduous service four men to each machine will give all the attendance necessary. A channeling machine, with its attendants, considered as doing the work of drill men, wedgemen and trimmers, is easily the equivalent of thirty to forty men in work capacity; and the quality of its product is better than hand labor can produce.

The "H8" track channeler does good work under pressure of 85 to 95 pounds; and 110 to 125 pounds is the very highest pressure needed on any Ingersoll-Sergeant channeler. It is questionable if a pressure above this maximum gives results with any increase of economy over that of the lower pressure, for the repairs, difficulties of lubrication, etc., augment with high-pressure machines, beside increasing the difficulty with valves and connections. The use of the boiler on the truck makes the machine independent and self-contained; and in actual results per channeler better economy is secured than could be had from independent boilers. But the very highest economy in the quarry system as a whole can be attained only where the power from a central air-compressing plant is applied to the channeler through a reheater.

The Fixed Back Channeler is adapted for service in those quarries where the rock beds are horizontal or nearly so; and in such contracting work as requires only vertical rock facing. In open quarries the small offset or bench left by the channeler at each level is of no consequence, being simply worked away as the limits of the quarry increase. Nor is there any objection to these benches in canals or open cuts where only a few levels are needed to reach the desired depth. For working close up to end walls, the cutting engine is moved to either end of the frame by means of a pinch bar; the channel can thus be carried close up to both ends without turning the machine on its track.



An Ingersoll-Sergeant "H 8" Track Channeler in operation at Bedford, Indiana.

Ingersoll-Sergeant Fixed Back Channeling Machines Types "H8" and "H9"

THE Ingersoll-Sergeant Fixed Back Track Channeler is distinguished by a massive strength which is a guarantee of power and endurance. It is designed throughout for the heaviest and most severe service.

The general type is that of a truck mounted on four flanged wheels running on a track. Upon this truck is carried a boiler (in the steam-driven machine) or a reheater (in the air-driven channeler) together with a powerful chopping engine mounted at one side on a frame of great strength. Upon the end of the piston rod of this engine are mounted cutting steels which are driven against the rock by steam or air in the engine cylinder. For feeding the steels against the rock as the cut increases in depth, a second engine raises and lowers this cutting machine in its guides. A third engine, geared to the truck axles, moves the entire machine along the track. The resultant of these three motions—cutting, feed and travel—is a slot or channel in the rock, a few inches in width according to the gauge of steel, of a length limited only by the track travel, and of a depth determined by the length of steels used.

The direct-acting single-gang principle has demonstrated its preëminent superiority in years of varied service; it is retained in the Ingersoll-Sergeant channeler and its possibilities developed to the utmost. Piston and steels are in a straight line; power is applied to resistance in the most direct and positive manner, with the least possible loss in transmission. The blow is direct and powerful. The great weight of the channeler, together with its massive construction and rigid structure, absorbs vibrations, assures the highest mechanical efficiency, and gives a peculiarly effective cutting quality to the blow.

The design and construction of the new "H8" and "H9" Fixed Back Track Channelers are detailed at length in pages following. But for the benefit of those who seek the salient points of superiority without going into the minor essentials, the features are grouped here which distinguish these latest channelers, not only from earlier models of the same type, but also from contemporary machines of other makes.

Points of Superiority

Three powerful independent engines handling the three operative motions of cutting, feed and travel.

A piston tail-rod passing through the back head of the cylinder of the cutting engine, relieving wear on cylinder walls, avoiding broken piston rings, preventing cutting, removing binding strains, and maintaining perfect alignment of reciprocating parts. This is the only construction which provides for the great strains incidental to the constantly glancing blow consequent upon the chipping action of the bitts, and the still greater strains caused by neglect to promptly reverse at the end of the cut. Because of this feature the cylinders and piston parts outwear two to three sets of other makers.

A new positive valve mechanism driven from the piston tail-rod, elevated above the cylinder and secure from dust and mishap.

All joints bushed with hard steel in the valve mechanism, and provided with split adjustment, compensating for lost motion and preventing deranged valve action under long service.

A small flat auxiliary valve held to its seat under pressure, controlling the movement of the main valve, relieving the valve mechanism from the severe service of moving a large unbalanced main valve, and making the main valve action independent of the length of stroke. The auxiliary valve, being its under pressure, only tightens in service.

A perfect, yet adjustable, cushion at both top and bottom of stroke, using exhaust steam or air only, permitting the machine to work safely across seams, depressions and soft spots, or to cut in broken material.

Wholly-enclosed dust-proof three-cylinder reversible balanced engines controlling vertical feed of the cutting engine and track travel of the channeler, dispensing with all friction clutches, reversing gears and chain drives.

Telescopic joints in all piping, in lieu of the troublesome

swivel pipe joint with its inevitable leakage, discomfort and loss of power.

The extension of all controlling levers—for cushioning the blow, varying the feed and governing the travel—so as to be equally accessible from either end of the channeler when running.

Vertical guides for crosshead separately adjustable—top and side—in all directions, avoiding all lateral vibration and wear in the cutting engine, and made of the best metal for the purpose.

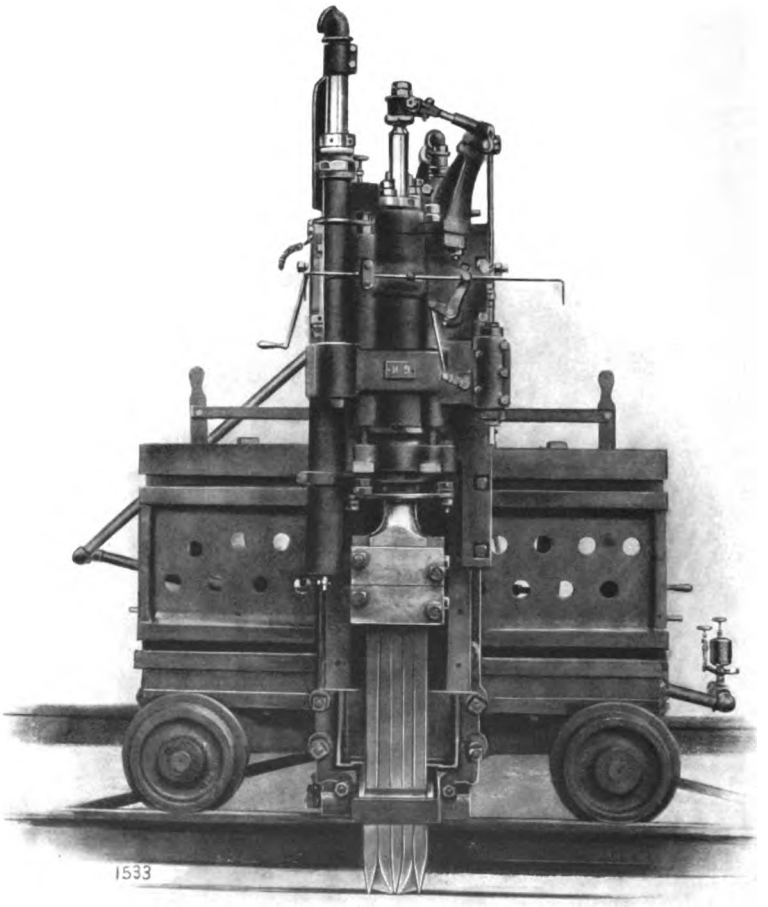
An adjustable feed nut, with long bearings, permitting an accurate taking up of wear, and avoiding lost motion.

Parts built throughout to limit gauges and strictly interchangeable. Parts are carried in stock at the different branch warehouses and may be had at once in emergencies. Very few parts are required, under reasonable freedom from abuse. These new models have all been thoroughly tested out by two to three seasons' hard service and have shown themselves remarkably free from repair costs and interruptions in service.

A design which admits of the best work with reasonably low and safe steam pressures, with easy firing and great economy in coal.

* * * * * * * * * *

These are some of the most distinctive features of the "H8" and "H9" Fixed Back Track Channelers. Their value will be appreciated by every one familiar with the requirements of channeler practice and the limitations which hamper the operation of other machines. The combination of these valuable elements in the present models has resulted in **a track channeler of highest power, maximum efficiency and greatest cutting capacity—a machine in which is united the maximum of effectiveness with the minimum of operative cost.**



Ingersoll-Sergeant "H 9" Track Channeler showing the Roller Guide in position. This Channeler may be equipped with a Crosshead and Solid Guides in place of Chuck and Roller Guides.

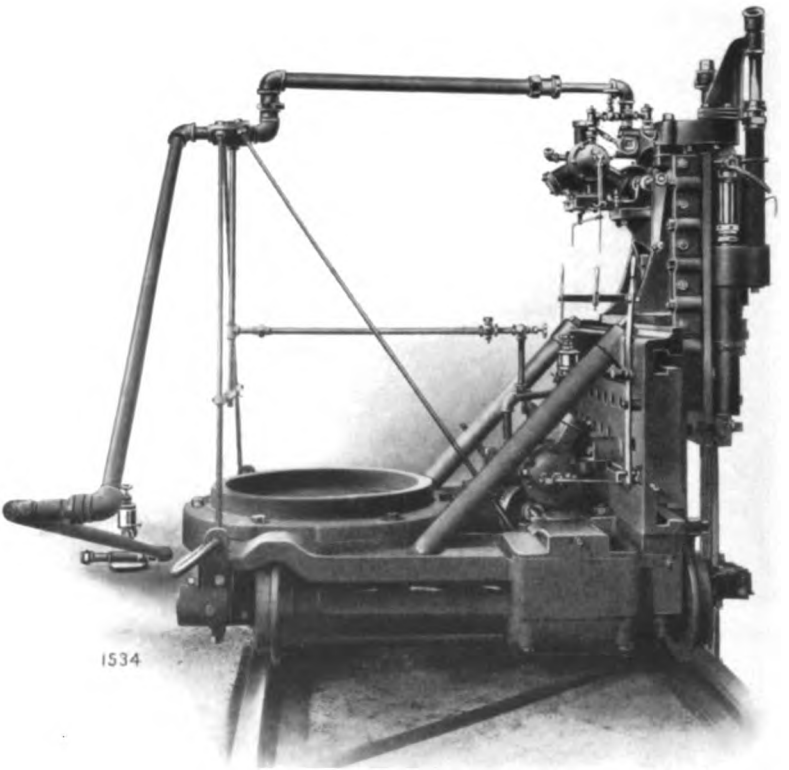
Details of Construction Ingersoll-Sergeant Fixed Back Channeler

Truck

THE channeler truck is a solid structure, ribbed and reinforced, bearing the entire weight of frame, engines, and boiler or reheater when used. The chilled cast truck wheels are keyed to the axles and the flange is of extra thickness to sustain the weight when the machine is off the track. The axles are of tough high-carbon steel, large in diameter and running in removable babbitted journal boxes. Collars prevent any lateral movement of the axles. Heavy straps and eyes receive the lifting bails by which the machine may be swung from a derrick. The center of gravity of the entire machine is low and the weight disposed to the greatest advantage, making the channeler run very steadily with less strain in moving over rough places.

Frame

The front frame upon which the cutting engine is mounted is a solid casting securely bolted to the truck at a planed joint. Strong diagonal steel rods passing through heavy cast tubes abut at a finished joint against lugs on frame and truck, bracing the frame with perfect rigidity. The advantage of a separate frame and truck as compared to a single solid casting is that the possible weakness arising from shrinkage strains in a large and difficult casting is avoided; furthermore, the arrangement permits a higher front frame, giving better support for the cutting engine and relieving the guide shell from buckling strains. The frame has a finished surface on the front face and the upper edge, upon which bears the guide shell. A heavy shoulder on the latter hooks over the frame and sustains the weight of the engine, shell and steels. Strong steel bolts traveling in T slots in the frame secure the shell in position at any point between the two extremes. The shell and engine is moved from point to point by means of a pinch bar inserted in holes in the frame. The shell has a wide bearing surface upon the frame, with a consequently reduced tendency to spring and bind in action.



Side View of the Fixed Back Channeler showing the Guide Shell and the Three-Cylinder Engines for Feed and Travel.

Guide Shell

The shell upon which the cutting engine slides is a strongly ribbed casting having a wide bearing on the frame, to which it is secured as just described. Two separate sets of guides—front and side—are provided, accurately surfaced, independently adjustable and secured to the shell by heavy bolts. Adjustment is thus provided in two directions; wear is taken up by the use of shims or liners, and perfect alignment maintained without any lateral vibration and exaggerated wear. The guides for the cutting engine and the cross-head are separate and independent—another refinement providing for possible unequal wear in these two parts.

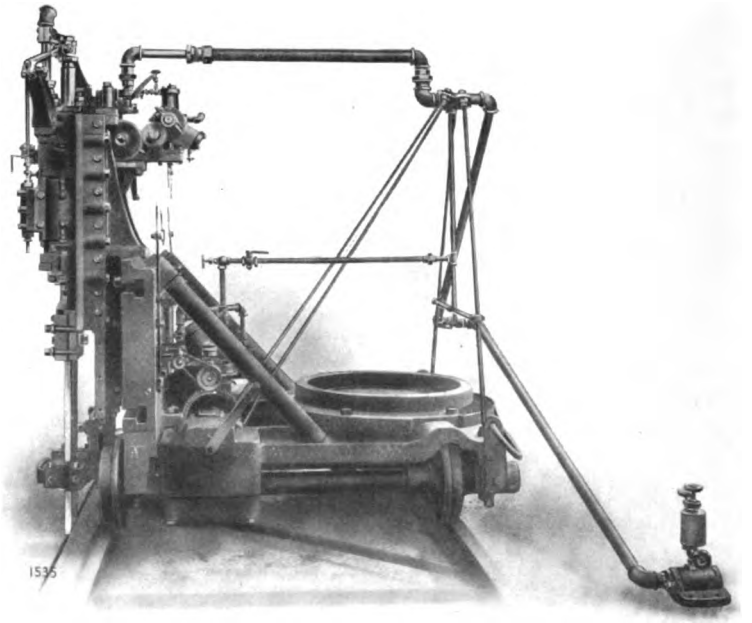
Feed Engines

The engines for feed and travel are of standard Ingersoll-Sergeant three-cylinder balanced type, self-contained and wholly enclosed. These machines have been redesigned throughout and strengthened over former models. Their power has also been increased. Crank pins, connecting rods and shaft have been enlarged, bearings lengthened and cylinder diameters increased, and pistons fitted with improved steam-tight rings. The details have been carefully studied and the result is an engine of high efficiency, great reliability, perfect balance and minimum dimensions. Crank parts run in an oil bath which also floods the bearings. The engines are reversible and are started and stopped, speeded or reversed, by a single lever.

Ingersoll-Sergeant Three-Cylinder Engine

Track Feed

Worm gearing communicates motion from the track travel engine to the truck axles; every wheel is a driver. Bronze worm wheels, securely clamped on each axle between heavy cast-iron collars, mesh with worms of high carbon steel, keyed to a steel driving-shaft turning in babbitted bearings. The track feed engine is mounted midway between the axles and drives the worm shaft through cut gears. The reversible engine dispenses with the annoyance of reversing gears or friction clutches. The worm gearing on both axles is fully enclosed in a dust-proof iron box which also serves as an oil bath in which the wheels dip. A sheet steel hood protects the engine and reducing gears. The worm shaft is squared at both ends to receive a crank by which the channeler may be moved by hand. The engine controlling lever is brought up and extended so as to be within reach of the operator from either end of the channeler. In addition to this lever control, a throttle valve is inserted in the supply pipe, and a governor limits the speed of the engine.



Showing the Side of the "H 9" Track Channeler. Three-Cylinder Engine Raising and Lowering the Main Cutting Engine.

Vertical Feed

The raising and lowering of the main cutting engine is provided for by a second three-cylinder engine, mounted on a bracket cast solid with the shell, and geared to the feed-screw through a worm shaft and cut steel reducing gears. This engine also is separately controlled by a single lever reached from either end of the machine; a valve in the supply pipe affords further protection. Hand feed is provided by a crank at either end of the feed worm shaft. The feed-screw worm wheel, of bronze, is keyed in place and meshes with a cut feed-worm of high carbon steel keyed on a spindle turning in brass-bushed bearings. The feed-screw is of high carbon steel, oil-treated and toughened, with a threaded portion of unusually large diameter cut to Acme standard. End thrust is borne by generous brass bushings carried in heavy lugs on the shell. The long bronze feed-nut is made in two parts, with a micrometer adjustment for wear and lost motion, this greatly increasing the life of nut and screw.

Cutting Engine

The main cutting engine has a heavy, strong cylinder, with guide lugs and clamps for the feed nut integral parts of the casting. Heads join the cylinder at ground joints and are held in place by heavy through-bolts of steel. The steam branch-pipe is a box casting fastened to the top of the shell and piped direct to the source of pressure. A ground pipe working in a stuffing box gives telescopic connection between this branch pipe and the main port of the cylinder. A similar telescopic section in steam-driven machines delivers the exhaust to the stack of the boiler. Two straightway throttle valves control the supply and are of a new model in which pressure holds the plug to a close seat.

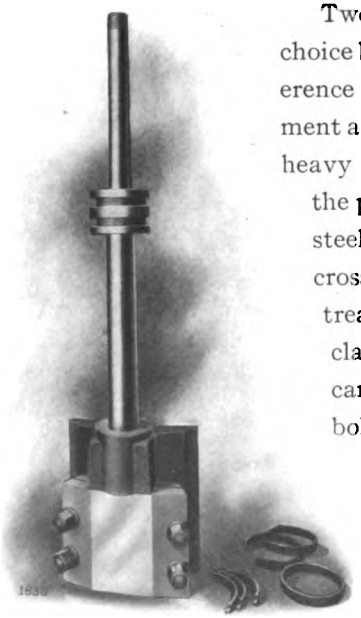
Valve Motion

Two valves, main and auxiliary, regulate the supply of air or steam to the cylinder. The main valve is a plunger-guided D-valve thrown by unbalanced pressures and bearing on a surfaced seat-plate. The auxiliary valve is a small D-valve held to its seat by pressure and operated through a telescopic lever from the tail-rod of the piston. The function of the auxiliary is simply to control the admission of pressure which throws the main valve. Its preëminent advantage lies in the fact that it relieves the valve mechanism from the severe duty of moving a heavy unbalanced main valve. It furthermore makes the main valve action independent of the length of stroke of the machine. Ports are unusually large and free. The valve action is quick and positive, and full pressure is instantaneously admitted to the piston. The valve mechanism is elevated well above the cutting engine, safe from dust and accidental injury. Its cast elements are of steel or gun-metal; all machined parts are of oil-treated high-carbon steel; bearings and joints have split adjustment with removable steel bushings. This last feature is a refinement which maintains the valve action at point of highest economy in long service. Cushion valves control and regulate compression at both ends of the stroke, exhaust steam or air only being used in this process. The cushion lever is extended to both sides of the machine, and by a small movement the lightest cushioned blow may be struck or full power delivered.

Piston

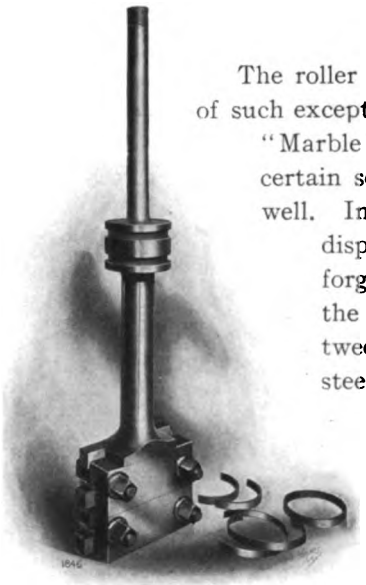
Piston, rod, and tail-rod are forged solid from a billet of high-carbon steel, oil-treated, annealed and ground true. The piston head is extra long and carries two sets of heavy new-style segmental rings forced outward by a flat spring. The tail-rod extends through the back cylinder head and operates the valve mechanism; it further serves the important functions of a back piston guide. This is a most important feature, for the reciprocating element of the channeler is the most vulnerable part and is subjected to the most severe service. The back piston guide maintains perfect alignment, relieves binding strains and avoids grooved cylinders, broken piston rings and shattered piston rods.

Cross-Head



Cross-head for Solid Guides.

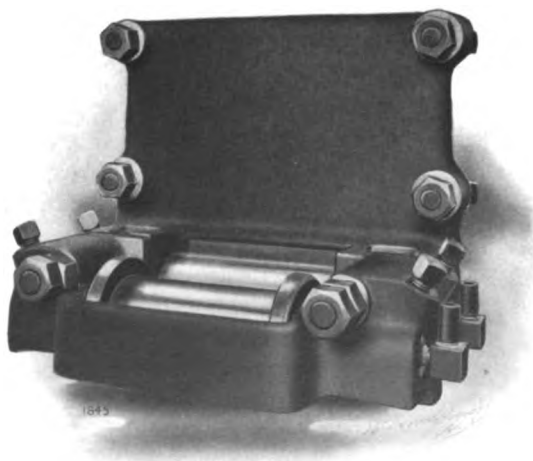
Two styles of guides are offered, the choice being left largely to the personal preference of the buyer. Under one arrangement a heavy cross-head is provided, being a heavy steel casting driven to a taper fit on the piston rod. This receives the cutting steels held in place by the clamp. The cross-head clamp is a steel forging, oil-treated, annealed and machined. The clamp bolts are extra heavy and of high-carbon steel; the adoption of a swing bolt at this point saves much valuable time in changing steels. The cutting steels abut directly against the cross-head and are held rigidly by the wide clamp contact. The whole device bears in ample guide surfaces in the lower portion of the shell.



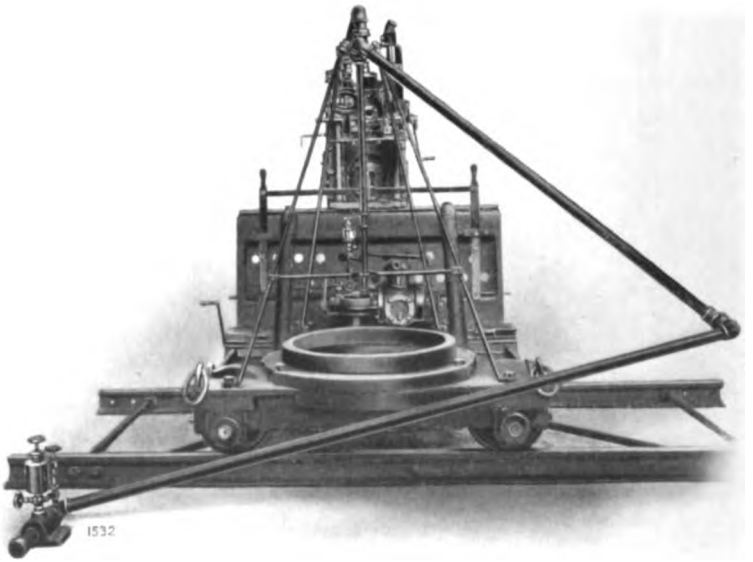
Chuck used with the Roller Guide

Roller Guide

The roller guide is a later device which proved of such exceptional value on the "Broncho" and "Marble" Channelers that it was applied for certain service on the heaviest machines as well. In this arrangement the cross-head is dispensed with entirely and a chuck, forged solid with the piston rod, receives the cutting steels. The bits work between two guide rollers of hardened steel, guiding them on all four sides. This relieves the machine from the weight of the heavy cross-head and the friction of the cross-head guides; the friction of the steels in the rollers is practically negligible. With this device a split front head is required, held in place by a strong forged steel ring drawn on a taper by the cylinder through-bolts. In changing steels, one or two bolts are loosened and the front roller lifted away, when the steels may be cleared. The guide rollers are mounted on a plate which can be raised or lowered on the shell of the machine. The use of the roller guide permits the machine to strike a more rapid blow, and increases its cutting power and capacity in material somewhat springy or elastic in nature. In "mud cuts" the heavy cross-head is undoubtedly an advantage—in free cuts the roller guide may give the best results.



The Roller Guide



Back of a Fixed Back Track Channeler showing Piping, Braces and Stays.

Piping

Each of the three engines on the track channeler have independent piping from the source of pressure and any one may be cut out without affecting the other two. Pipe and fittings throughout are *extra heavy*, everywhere well braced and stayed. Wherever flexibility is required, telescopic joints and stuffing boxes are used instead of the old-style swivel joint with its troublesome leakage. Cylinder lubrication is provided by a sight feed lubricator on the main supply pipe.

Boiler

Boilers are of the vertical submerged flue type, with the shell extended at the top to give a large steam chamber. The material is flange steel of 60,000 pounds t. s., properly stayed and braced. Each boiler is tested by hydrostatic test and built for a working pressure of 150 to 200 pounds. Hand holes give ready access for inspection and cleaning. The boiler is a quick and economical steam-maker and requires a minimum of repairs. The fittings supplied include steam and water gauges, injector, water tank, safety valve and fire tools.

An "H 8" Fixed Back Track Channeler equipped with an Air Reheater of the Sergeant type.

Reheaters

When compressed air is to be the source of power, a reheater is supplied where the very highest economy is sought. This is of one of the standard Sergeant types, giving the maximum heating effect with a small fuel consumption. A very small quantity of fuel used in these reheaters will reduce the volume of free air required by the machine from 20 to 25 per cent., as compared with that demanded when cold air is used.

Track

The standard track equipment furnished with each channeler provides for a total length of forty-two feet, in three sections of twelve feet and one of six feet. Standard 80-pound rail is used and gauge is maintained by the use of heavy forged distance pieces, with diagonal braces of the same stock. This stiff, solid track now provides for the minimum of blocking, without vibration.

Equipment

The equipment with each "H8" and "H9" machine is as follows:

One tool chest, containing shims, hatchet, hammer, wooden level, steel square, three files, cold chisel, hand saw, twenty-one wrenches, waste, packing, crosshead clamp, keys, bolts, nuts and washers; seat, step, lifting bails, three 12-ft. sections of track, one 6-ft. section of track, splice bars, bolts, nuts and pins; adjustable square, wooden straight edge, steel bar, chest of wooden track blocks, iron bar, scoops, scrapers, gauge for bits, one set of steels (see page 28); lubricators, oil cans, steam cylinder oil, machine oil, piston ring entering band, and hooks.

When a boiler is used, the equipment also includes a slicer, hoe and poker.

Steels are furnished according to the stone to be channeled, as follows:

Steels for Marble and Limestone When Used with Crosshead

Fifty pieces of steel constitute two sets (10 gangs, 5 pieces to each gang), to channel to a depth of 7 ft. in marble and limestone. Size of steel, $\frac{7}{8}$ in. by $1\frac{1}{2}$ in.

2	Gangs—	10	pieces,	each	1 ft. 6 in.	long.
2	"	—10	"	"	3 ft.	"
2	"	—10	"	"	4 ft. 6 in.	"
2	"	—10	"	"	6 ft.	"
2	"	—10	"	"	7 ft. 6 in.	"

The Blacksmith's Gauge for Steels for Marble and Limestone, commences at $1\frac{1}{2}$ in. and reduces 1-16 in. on each length from the 3-foot lengths up. The starters and the 3-foot lengths have the same gauge, $1\frac{1}{2}$ in.

All gangs of the same length have the same gauge.

Steels for Sandstone When Used with Crosshead

Thirty pieces constitute two sets (10 gangs, 3 pieces to each gang), to channel to a depth of 7 ft. in sandstone. Size of steel, $\frac{7}{8}$ in. by $2\frac{1}{2}$ in.

2	Gangs—	6	pieces,	each	1 ft. 6 in.	long.
2	"	—6	"	"	3 ft.	"
2	"	—6	"	"	4 ft. 6 in.	"
2	"	—6	"	"	6 ft.	"
2	"	—6	"	"	7 ft. 6 in.	"

The Gauge for the Sandstone Bits commences at 3 in. and reduces $\frac{1}{4}$ in. on each length from the 3-foot lengths up. The starters and the 3-foot lengths have the same gauge, 3 in.

All gangs of the same length have the same gauge.

Steels for Marble and Limestone When Used with Roller Guide

Fifty pieces of steel constitute two sets (10 gangs, 5 pieces to each gang), to channel to a depth of 7 ft. in marble or limestone.

Each gang uses 3 steels 1 in. by $1\frac{3}{8}$ in. and 2 steels 1 in. by $1\frac{1}{4}$ in.

2	Gangs—	10	pieces,	each	2 ft. 6 in.	long.
2	"	—10	"	"	4 ft.	"
2	"	—10	"	"	5 ft. 6 in.	"
2	"	—10	"	"	7 ft.	"
2	"	—10	"	"	8 ft. 6 in.	"

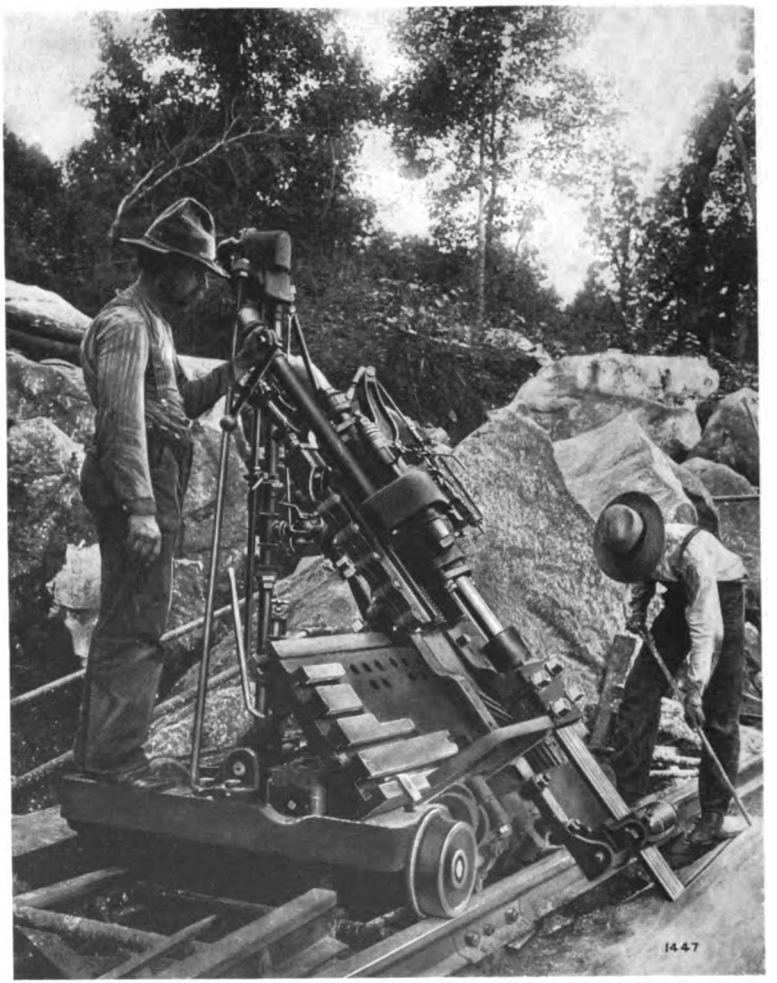
NOTE.—It will be noticed that these steels are longer for a given depth of cut than when a crosshead is used, but this extra length is used by Roller Guide.

The Blacksmith's Gauge for Steels for Marble and Limestone commences at $1\frac{1}{2}$ in. and reduces 1-16 in. on each length from the 4-foot lengths up. The starters and the 4-foot lengths have the same gauge, $1\frac{1}{2}$ in.

Specifications of Ingersoll-Sergeant Channelers

SIZE AND TYPE			Fixed Back Channeler "H8"	Fixed Back Channeler "H9"	Swing Back Channeler "H9"	Swing Back Channeler 6 in.	Swing Back Channeler 5 in.	Undercutting Channeler	Broncho Channeler
Diameter of Cylinder		in.	8	7	7	6	5	3½	3½
Length of Stroke		in.	9	9	9	6½	6½	7	6½
Distance of Cut from Vertical Wall		in.	7¼	7¼	7¼	7¼	5	8½ (lift)	
Distance from Center to Center of Cut with Machine Reversed		ft. in.	7 - 0	6 - 0⅝	6 - 8⅝	4 - 7⅝	4 - 6⅝		
Inside Gauge of Track		ft. in.	5 - 3	4 - 4⅝	4 - 4⅝	3 - 0⅝	3 - 0⅝	4 - 0⅜	
Length over all		ft. in.	5 - 3	5 - 3	5 - 2	5 - 5	5 - 5	5 -10½	14 - 0
Width over all	Without Boiler	ft. in.	7 - 1	7 - 0½	7 - 4½	5 - 5	5 - 2	8 - 3	2 - 6
	With Boiler	ft. in.	7 - 6½	7 - 6	7 -10				
	With Reheater	ft. in.	7 - 3½	7 - 3	7 - 7				
Height	Without Boiler	ft. in.	7 - 4	7 - 4	7 - 2	6 -10½	6 -10½	2 -10	6 - 0
	With Boiler	ft. in.	10 - 0	10 - 0	10 - 2				
	With Reheater	ft. in.	7 - 4	7 - 4	7 - 2				
Weight of Channeler alone	Without Boiler	lbs.	9,000	9,000	8,000	5,150	4,850	6,800	2,375
	With Boiler	lbs.	12,900	12,900	11,900				
	With Reheater	lbs.	10,300	10,300	9,300				
Total Shipping Weight with Track and Equipment	Without Boiler	lbs.	† 13,900	† 13,900	13,700	† 10,500	† 10,200	† 11,800	‡ 3,500
	With Boiler	lbs.	† 17,875	† 17,875	17,675				
	With Reheater	lbs.	† 15,175	† 15,175	15,000				
Code Word	Without Boiler	lbs.	VOERLABADO	VOERLABBIO	VOERLABODA	VOERLABRA	VOERLABRED	VOERLACAIT	VOERLACAL
	With Boiler	lbs.	VOERLABAIS	VOERLABEGA	VOERLABOS				
	With Reheater	lbs.	VOERLABARE	VOERLABEM	VOERLABOUR				

*Height is from top of rail to top of boiler hood which does not include stack.
†These weights are for domestic shipment. Add 1000 lbs. for foreign shipment.
‡This weight is " " " " 200 " " " "



Swing Back Type of Ingersoll-Sergeant Track Channeler as illustrated in the 5-inch "Marble" Channeler.

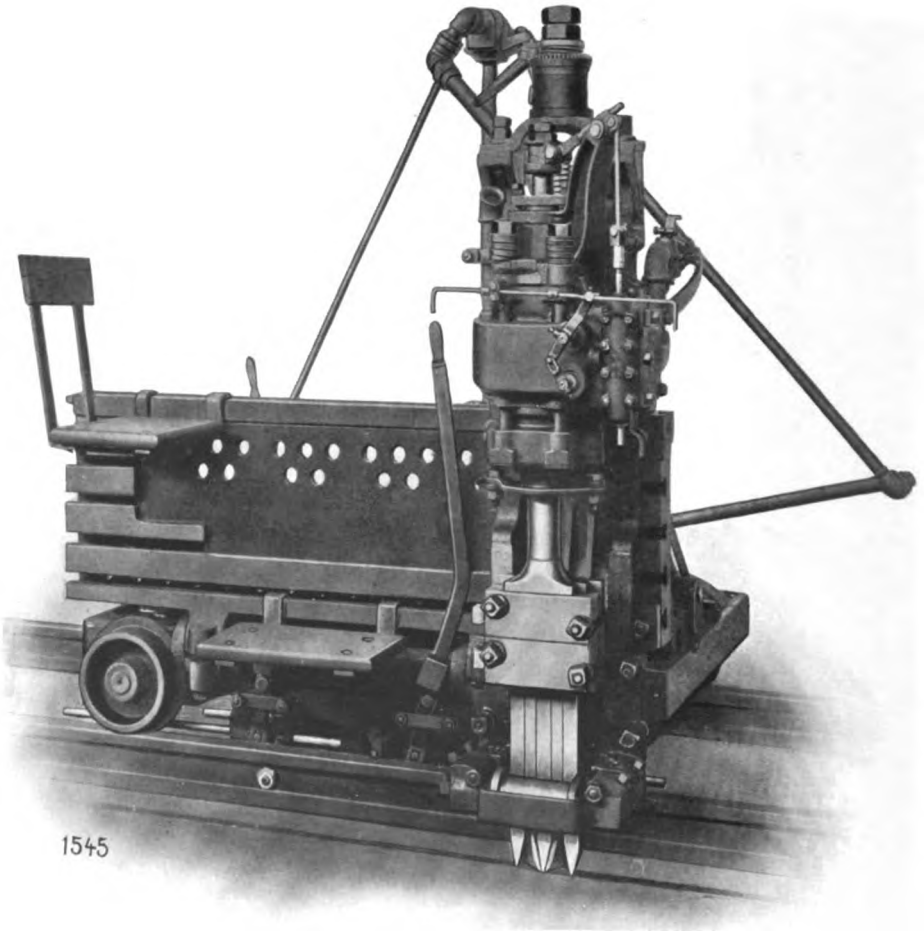
Ingersoll-Sergeant Swing Back Track Channelers

IN the Fixed Back Channeler the movement of the steels is limited to two vertical planes and the cut made is vertical with square ends. The field of the fixed back machine has been already defined. But there are other conditions which demand a greater adjustability.

The Swing Back Track Channeler is intended for angular cutting in quarries where the floor is to be enlarged, or where the formation dips or inclines and it is desirable to follow it without removing the overlying rock. Under these last conditions it is still necessary to channel at right angles to the rift of the rock bed and the swinging frame makes it possible to make the proper angular adjustment. The swing of the cutting engine around a trunnion, in the plane of the frame, permits adjustment for transferring cuts and working up into corners.

In machines of this type the frame carrying the cutting engine swings on a hinge joint, giving an angular adjustment up to forty-five degrees from the vertical in the bare machine, or fifteen degrees in the machine carrying a boiler or reheater. In addition to this movement, the cutting engine itself swings in the plane of the frame, with an angular range up to forty-five degrees either side of the vertical.

The cut on the opposite page illustrates one of these Swing Back Channelers. Details of size, capacity and construction are furnished on application.



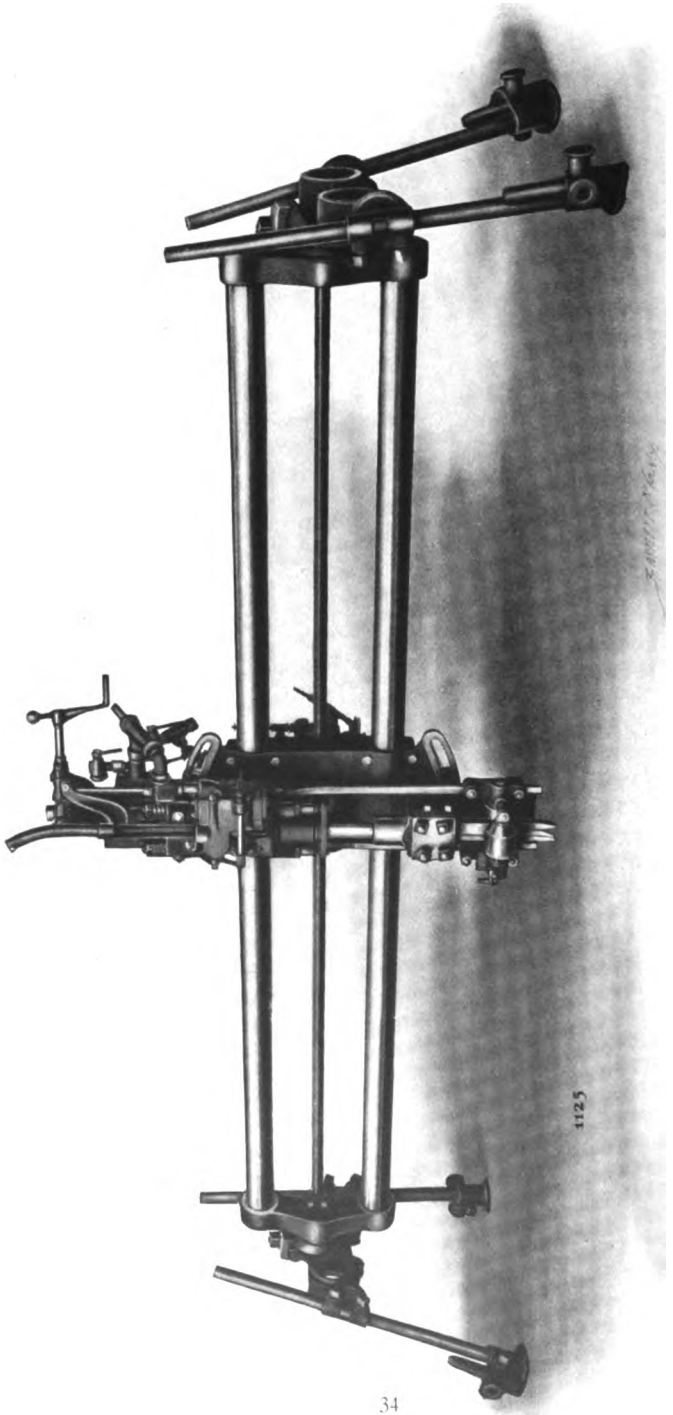
Ingersoll-Sergeant "Marble" Track Channeler
of the 6-inch size.

Ingersoll-Sergeant "Marble" Track Channelers

THE requirements of marble channeling are peculiar. The rock will not stand the powerful blow of the heaviest machines, for it shatters out of the line of the cut under the heavy impact. Furthermore the marble deposits are found at all angles, necessitating in a machine for channeling a wide adjustability and light weight.

It is to meet these characteristic conditions that the Ingersoll-Sergeant Drill Company has developed a small channeler, which has been given the distinctive name of the "Marble" Channeler. While the general principle of the heavier track machines has been retained, including the direct-acting single-gang type and the methods of feed and travel, yet important details have been changed to meet the peculiar demands of the service. The machine is light and easily moved, yet strong and reliable; the methods of control are convenient and effective. Since one of the strong features of the "Marble" Channeler is its great adaptability to inclined deposits, it is of necessity a swing back type; and that full advantage may be taken of its adjustability, it is never equipped with a boiler or reheater, but takes its power through a flexible arrangement of piping.

These machines have established a record in the last few years, in the marble fields of Vermont, Tennessee and other districts. In daily service under all conditions they have shown a cutting capacity one-quarter to one-third greater than any other marble channeler. Their correctness of principle, their superiority in design, material and workmanship, their endurance under hard service, are recognized by all users. These qualities, together with their universal adaptability to marble of all grades and deposits at all angles, have won for the "Marble" Channeler a wide sale and a leading place in the marble industry.



The "Broncho" Channeler.

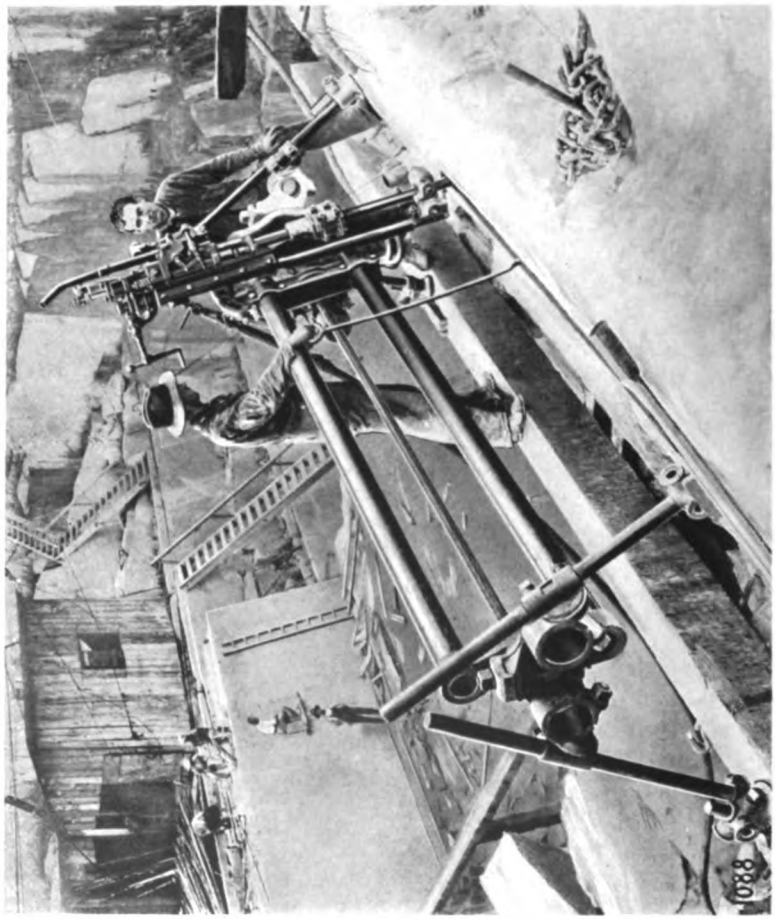
The Ingersoll-Sergeant "Broncho" Channeler

AS the knowledge of stone channeling methods has extended, the need has become apparent for a channeling machine intermediate in its functions and capacity between the heavy track channeler on the one hand and the light quarry bar with its drill on the other.

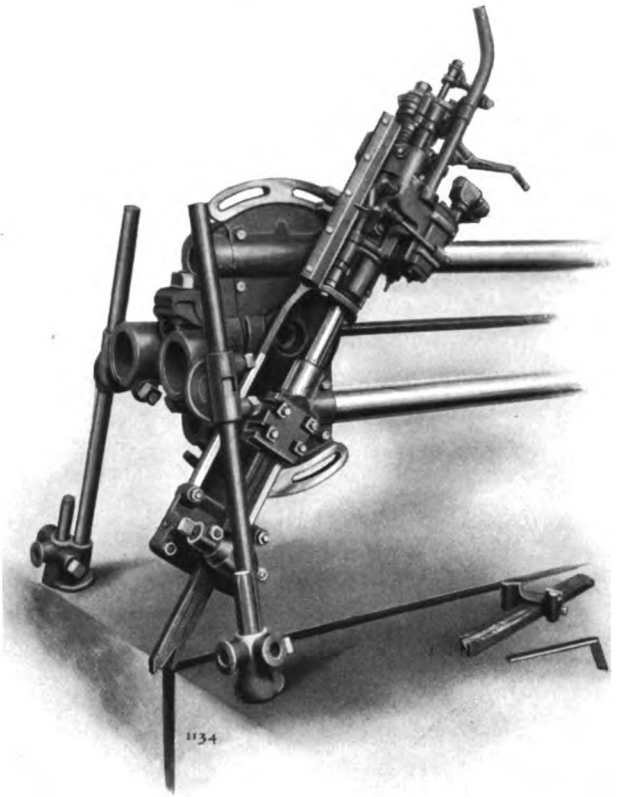
The Ingersoll-Sergeant "Broncho" Channeler is such a machine. It is a light, powerful, efficient channeling engine suited for a wide range of work in quarries in all materials. It has also found a valuable place in certain classes of contract work, as in trench excavation.

The powerful track channeler has its proper field in heavy rock work, doing rapid, cheap cutting, making long and deep cuts, in any grade of material, however difficult. But there are many cases in which the lighter and cheaper "Broncho" Channeler will be found fully as effective, yet more economical and satisfactory in its operation. For instance, on deposits having a sharp dip or incline, the track channeler is impracticable. The "Broncho," on the contrary, with its light, flexible, sturdy mounting and easy adjustment, is peculiarly fitted for these difficult conditions. In opening up new quarry properties, this lighter machine provides a ready and rapid means of "proving up" the value of the deposit, without going to the heavy initial outlay for a more powerful cutting equipment. In this case its use spares the expense of a permanent outfit of greater capacity until the property has been placed upon a paying basis of production. In established quarries, the machine proves a most valuable adjunct to the heavier channelers when used for cutting sumps, removing key blocks, and enlarging the walls. It is particularly useful and effective in confined spaces and on irregular surfaces.

While the "Broncho" is an outgrowth of the experience gained with the bar channeler, it is in no way to be compared with this earlier device. Lessons learned in the use of the lighter machines have resulted in the distinctive features of design which give the new channeler a greatly increased power, speed, capacity and adaptability, and which mark it as an entirely new type.



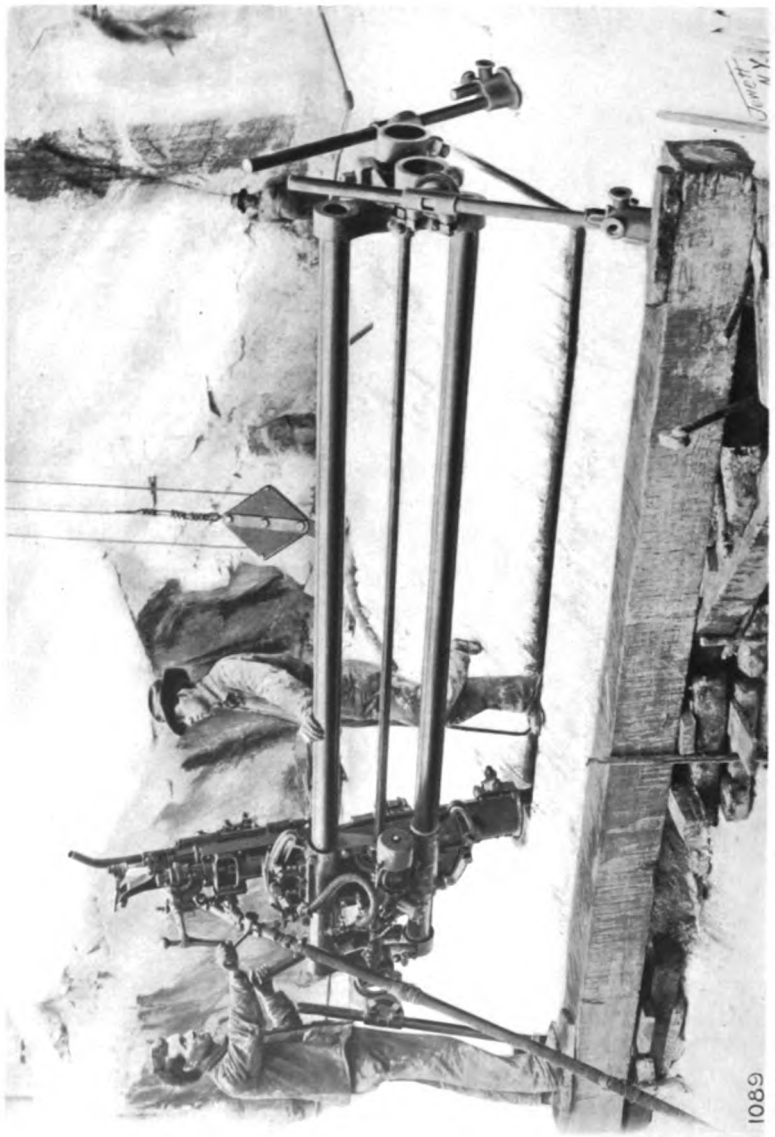
The "Broncho" Channeler at the Waverley Marble Quarries, Tuckahoe, N. Y.



The "Broncho" Channeler arranged for transferring.

The illustrations show that the "Broncho" consists of a carriage supporting the cutting engine, mounted on two parallel bars along which it is moved automatically by means of a three-cylinder engine actuating a traveling feed nut. The speed of this engine is limited by a governor, but within this limit can be regulated at will, giving the carriage a travel suited to varying qualities of material. The engine is automatically reversed at each end of the travel; or the stops can be set at any intermediate point, causing the carriage to move back and forth at less than full bar length and at any desired part of its travel.

While the cutting engine on the old bar channeler resembled a heavy rock drill in construction and operation, the channeling engine and valve gear on the "Broncho" are very similar to those used on the heavy track machines. The cylinder is three



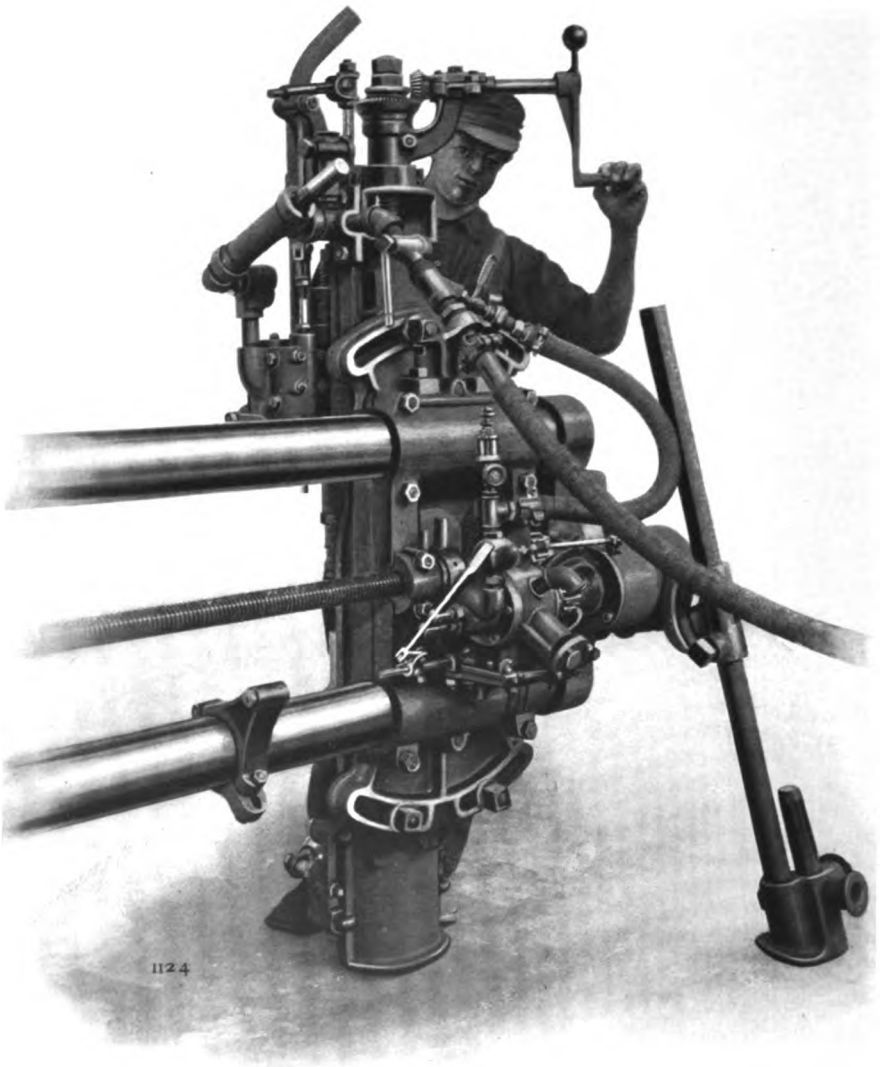
The "Broncho" Channeler on a Side Hill at the Waverley Marble Quarries, Tuckahoe, N. Y.

and one-half inches in diameter. The full stroke is six and one-half inches; it can be varied, however, from full normal down to two inches. A cushioning device puts the force of the blow under ready control. This latter arrangement is a most valuable feature in starting cuts, in working through soft spots, or in cutting across splits and seams. The valve action is moved by the piston tail rod passing through the back head, but is wholly independent of the length of stroke. This tail rod further secures all the advantages of a back piston guide, in relieving the action, reducing the wear on piston rings and cylinder bore, and in giving a free, easy motion with no tendency whatever to bind.

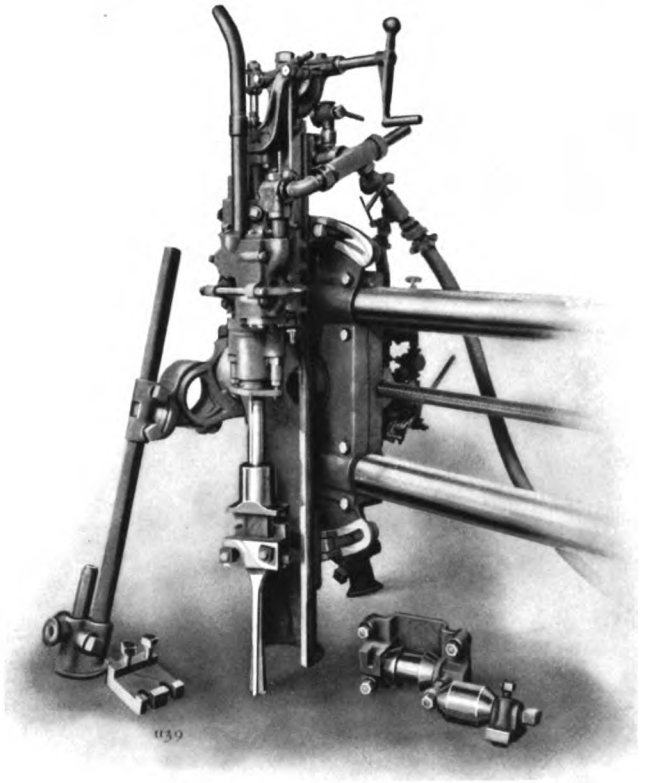
A simple attachment permits the "Broncho" to be used in drilling a round hole at either or both ends of its travel. This is the only machine which will cut an open channel, as well as drill a hole, in any position from vertical to horizontal. When used as a rock drill, the roller guide attachment is removed by loosening four hook bolts; the rotation is then thrown in gear; and a regular drill steel is applied in the usual manner.

A novel and most valuable feature of the "Broncho" Channeler is the Sergeant patent roller guide. It consists of two case-hardened steel rollers between which the steels work. Its use dispenses with the old-style cross-head, dowel pins, guides, etc. The cylinder is short, and the piston being freed from the weight, friction and pinching effect of the cross-head, the stroke of the machine is much more rapid and the blow harder. The rollers guide the steels on all four sides, preventing them from glancing off in the cut. The use of the roller guide leaves the machine free to run with even more speed and power than a rock drill of the same size. The guide arrangement is fastened to a plate and can be raised or lowered on the channeler shell. In changing steels, one bolt is loosened and the front roller simply swung aside. A long experience with this novel device has shown no appreciable wear.

The feed crank of the "Broncho" can be swung to the right or left hand side of the machine, or clamped in any position at the operator's convenience. The leg adjustments are universal and rigid, a cone clamp effect being secured which gives the utmost stiffness to the mounting. The lower ends of the legs are fitted with shoes and lugs for the application of a pinch bar in moving the machine. Pointers are also provided in the shoes which can be "spotted" into the rock whenever a tendency appears to jar out of line with the cut on an inclined surface.



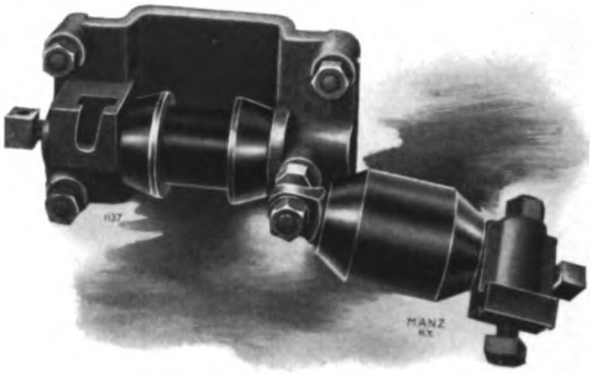
Rear View of the "Broncho" Channeler drilling the End Hole.



Front View of the "Broncho" Channeler drilling the End Hole; Roller Guide removed.

The normal full cut of the "Broncho" is ten feet six inches long and under favorable conditions a depth of twelve feet six inches has been reached. The machine will cut at any angle, this adjustment being secured by loosening one nut at each end of the frame and swinging the bars on center. A swinging adjustment in the plane of the cut is also provided, permitting the channeler to transfer cuts and work close up into corners.

The performance of the "Broncho" Channeler depends of course upon the hardness and quality of the material worked in, the steam or air pressure used, and the conditions under which the machine runs. Thoroughly tested in some of the hardest marbles, the "Broncho" has been found to cut practically the same amount as the heavier track machine. This surprising result is due to the fact that the full power of the larger machine would shatter the marble and cannot therefore be applied.



Roller Guide for the "Broncho" Channeler.

The light, rapid blow of the "Broncho," on the contrary, is fully effective and its full cutting capacity always available. In hard marble and limestone it will average 40 square feet of cut per day of ten hours, and in softer marble 80 to 120 square feet in the same time. Properly handled in ordinary sandstone, its performance is 75 to 125 square feet per day. It is especially effective in slate quarries, doing rapid, cheap work at the rate of 60 to 120 square feet per working day. In oolitic limestone, 125 to 200 square feet per day is an average rate.

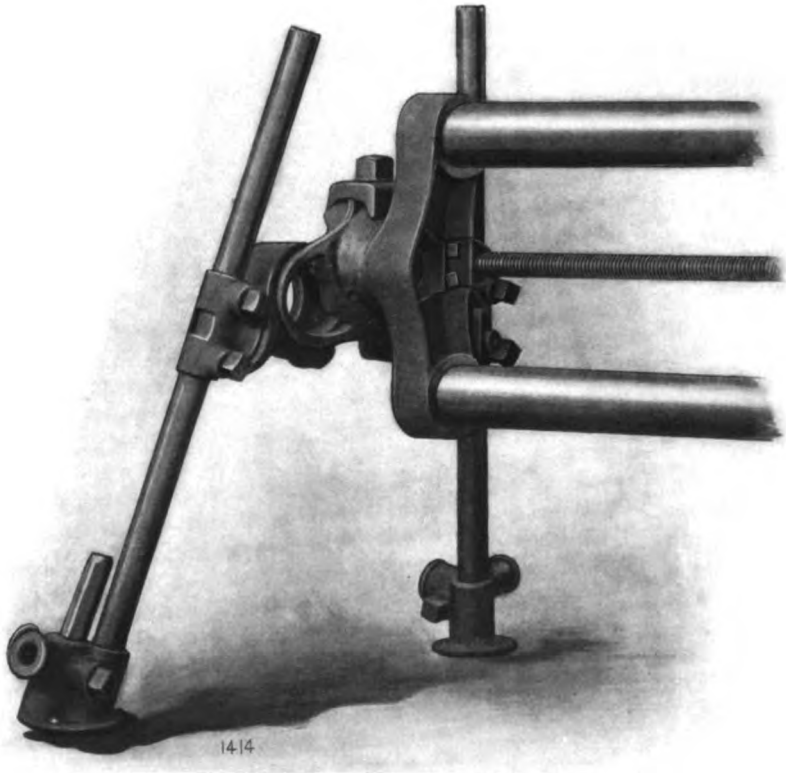
The "Broncho" does its best work in cuts seven to ten feet deep, with 100 pounds pressure at the throttle. But it runs well on lower pressures. The operating expenses are low, only one operator and a helper being required.

The equipment with each machine is as follows:

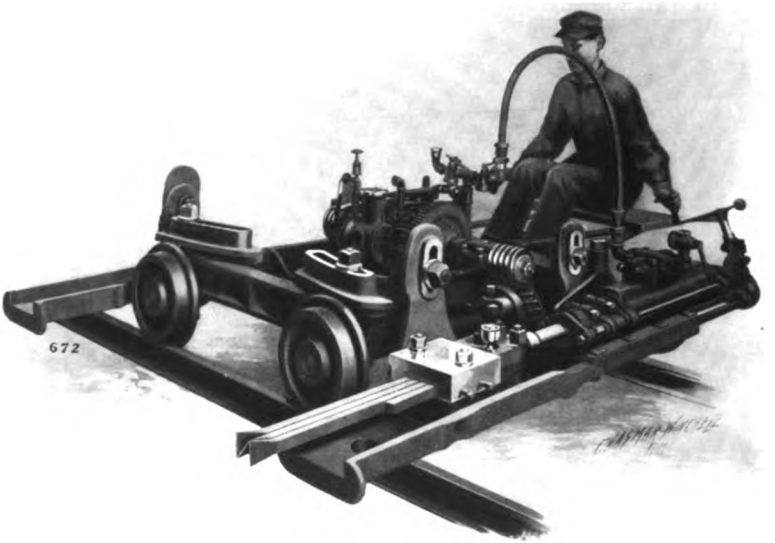
One tool chest, containing shims, clamps, hammer, level, square, three files, cold chisel, eleven wrenches, oiler, gauge for bitts, handle, clamp, set screws, waste, packing, cross-head clamp, bolts and nuts; one set of drill steels, one set of channeling steels; fifty feet of hose, one jack and lifting bales, iron bar and scoops, scrapers, and sand pump.

Specifications of the "Broncho" Channeler are as listed below:

Length over all,	14 ft.
Width over all,	2 ft., 6 ins.
Height from bottom of shell to top of tail rod, with piston at back head	6 ft.
Free air required per minute,	175 cu. ft.
Boiler H. P. required, when run by steam,	20 to 25.
Net weight, with equipment	2,800 lbs.
Domestic shipping weight	3,500 lbs.
Export shipping weight,	3,700 lbs.



End Pieces and Leg Adjustments for "Broncho" Channeler.



The Ingersoll-Sergeant Undercutting Track Channeler

THE Undercutting Track Channeler was designed to meet conditions in quarries of marble, slate, sandstone and other rocks in which there are no free horizontal beds, and the rift or cleavage of the stone is vertical or nearly so. In such places it is necessary to cut under the bench as well as channel the sides.

The machine consists of a heavy, stiff frame of cast iron mounted on four chilled wheels carried on steel axles running in babbitted boxes. Upon this truck is mounted a standard Sergeant three-cylinder engine, geared through worms to both axles and automatically feeding the machine along its track. At either end of the frame is a special guide shell, provided with a swinging adjustment in both horizontal and vertical planes, by means of which all angular conditions may be met and cuts carried clear into the corners. The shells are hung

very low, thus giving the least possible offset in cutting. The use of the two shells permits the channeler to work close to the wall in either direction and the adjustments adapt the machine to deposits at any angle or dip.

The cutting engine has a cylinder 3½ inches in diameter, and is closely similar to the standard "F" size drill. It has the usual solid chuck and U-bolt, and the Sergeant release rotation. A special feed screw cross-head is furnished, with bevel gears on crank and screw whereby the former turns in a horizontal, instead of a vertical plane. This permits the channeler to work closer to the track and reduces the height of the bench left. For putting in end holes, or drilling a line of "lofting" holes, standard "F" drill steels are used, the feed being 18 inches. When channeling, the steels used are three 1 x 1 inch steels, held in a clamp on a special cross-head fitting into the chuck.

The truck engine is started, stopped, speeded and reversed by a single lever; and this lever, with feed crank, throttle, and lubricator, is within easy reach of the operator without changing his position.

Outfit and Equipment

The equipment of each Undercutting Channeler includes the following:

One truck complete, with three-cylinder engine, worm shaft, gear, and clamps and hinge pieces.

One right-hand shell bare, but with standards and necessary connecting pieces.

One left-hand shell complete with standards and connecting pieces, feed screw and bevel gear crank.

One "F" 3½-inch steam drill, 1¼-inch shank, with the "15" style front head and fitted with Sergeant rotation and pawl-releasing attachment.

Two right-hand cross-head clamps.

Two left-hand cross-head clamps.

Four clamp keys.

One operator's seat.

One set of "F" drill steels for end holes, to a length of 7 feet 6 inches over all, in runs of 18 inches.

One set (2 gangs, 3 steels to a gang), of 1 x 1 inch channeler steels, starting with 1 foot 6 inches, to a length of 7 feet 6 inches over all, in runs of 12 inches, suitable to channel to a depth of 7 feet.

Two 12-foot sections of track.

One 6-foot section of track.

One 50-foot length of 1-inch 5-ply marline-wound steam hose, with couplings.

Eight fishplates.

Sixteen fishplate bolts and nuts.

One set steel wrenches.

One drill throttle. One No. 8 lubricator. One piece packing. One exhaust pipe. One metallic hose for connecting engine. Two plug cocks and piping. One part sheet.

Specifications

The detailed specifications are as follows:

Length over all, 5 feet 10½ inches.

Width over all, 8 feet, 3 inches.

Gauge of track, 4 feet ⅜ inch, inside.

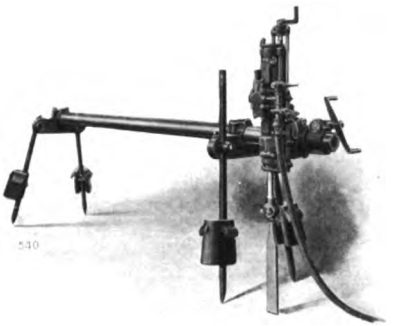
Height from top of rail to top of machine, 2 feet 10 inches.

Distance from bottom of rail to cut when undercutting horizontally, *i. e.*, height of bench left in cutting, 8½ inches.

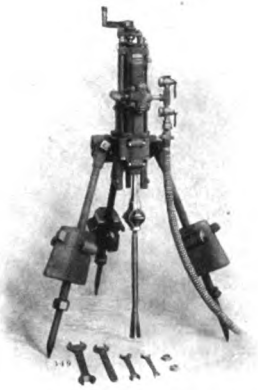
Total weight for domestic shipment, 6,800 pounds.

Total weight for foreign shipment, 7,500 pounds.

Ingersoll-Sergeant Machines for the Quarry

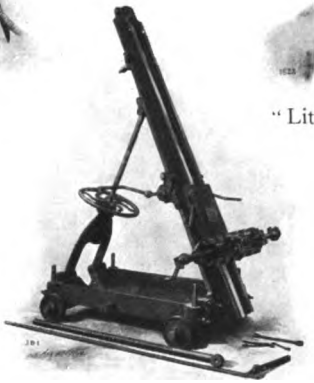


Quarry Bar



Rock Drill

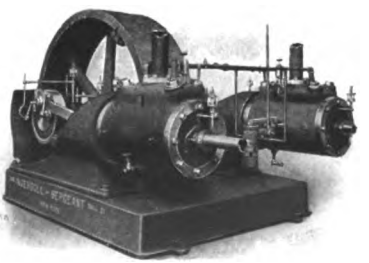
"Little Jap" Hammer Drill



Gadder

Air Compressors

A Steam-Driven Duplex Compressor of the Corliss Type



A Small Duplex Power-Driven Machine

Ingersoll-Sergeant Publications

No. 5. Catalog—Labor Saving Tools Operated by Compressed Air.
No. 35. Catalog—Air Compressors.
No. 43. Catalog—Rock Drills, Mining and Quarrying Machinery.
No. 51. Catalog—Compressed Air vs. Electricity in Coal Mines.
No. 52. Catalog—Coal Mining Machinery.
No. 73. Catalog—Water Lifted by Compressed Air.
No. 81. Catalog—Flowing Oil Wells with Compressed Air.
No. 109. Pamphlet—Compressed Air in Railroad Shops.
No. 146. Booklet—The use of Compressed Air in the Monon Railroad Shops.
No. 147. Booklet—Pumping Water by Compressed Air at Dixon, Ill.
No. 148. Booklet—Model Compressed Air Foundry Plant.
No. 154. Booklet—Rock Drill.
No. 167. Booklet—Abundant Pure Water Underground. The Air Lift.
No. 193. Booklet—Baldwin Acetylene Lamp for Mines.
No. 242. Booklet—Moving 100,000 Tons of Rock. Rock Drills.
No. 254. Booklet—Rock Drill Estimate.
No. 322. Booklet—The "Broncho" Channeler.
No. 337. Pamphlet—Before and After. Quarrying.
No. 340. Booklet—Blue Book of Air Compressors.
No. 341. Booklet—Driving the New York Subway.
No. 346. Pamphlet—The Central Air Plant.
No. 353. Pamphlet—The "Radialaxe" Coal Cutter.
No. 355. Booklet—Compressed Air Displacement Pumps.
No. 540. Booklet—The City of Rockford. Rock Drills.

A series of bulletins relating particularly to "Labor Saving Tools Operated by Compressed Air" has been started. Those already issued are:

No. 2000. The MacDonald Rivet Forge.
No. 2001. The "Little Jap" Hammer Drill.
No. 2002. Track Laying on the Williamsburg Bridge.
No. 2003. The "Little Jap" Hammer Drill (Second Edition).
No. 2004. Stone Working Tools.

Send us your name and address and we will send the others as they are issued.